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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 2003B138		FOR FURTHER ACTION		See Form PCT/PEA416
International application No. PCT/EP2004/014479		International filing date (day/month/year) 16.12.2004	Priority date (day/month/year) 18.12.2003	
International Patent Classification (IPC) or national classification and IPC INV. C07C29/141 C07C29/17 C07C45/50 C07C45/74 C07C11/02				
Applicant EXXONMOBIL CHEMICAL PATENTS INC.				
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau) a total of 7 sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>				
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the report</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>				
Date of submission of the demand 18.10.2005		Date of completion of this report 07.04.2006		
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tlx 31 651 epo nl Fax: +31 70 340 - 3016		Authorized officer Kardinal, S Telephone No. +31 70 340-3483		



**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/EP2004/014479

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-38 as originally filed

Claims, Numbers

1-45 received on 18.10.2005 with letter of 18.10.2005

Drawings, Sheets

1/1 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

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**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/EP2004/014479

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-41
	No: Claims	42-45
Inventive step (IS)	Yes: Claims	
	No: Claims	1-45
Industrial applicability (IA)	Yes: Claims	1-45
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

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Re Item V

Reasoned statement with regard to novelty and inventive step; citations and explanations supporting such statement

1. Reference is made to the following documents :

- D1: US 2003/114718 A1 (BUSCHKEN WILFRIED ET AL) 19 June 2003
- D2: US-A-4 684 750 (ZGORZELSKI WOLFGANG ET AL) 4 August 1987
- D3: WO 02/094740 A (MCMATH SARAH ELIZABETH JANE ; ANDERSON KRIS (GB); GOODRICH PETER (GB);) 28 November 2002
- D4: GB 643 503 A (N.V. DE BATAAFSCHE PETROLEUM MAATSCHAPPIJ) 20 September 1950
- D5: US-A-5 324 420 (DE MUNCK ET AL) 28 June 1994

2. Novelty and Inventive Step

2.1 Document D1 discloses (cf. the passages indicated in the international search report) a process for the production of alcohols by hydroformylation and catalytic hydrogenation in the presence of water which is dissolved in the homogeneous liquid hydrogenation mixture such that no additional liquid water phase is present under reaction conditions. The process according to D1 aims to improve the yield in alcohol by hydrolysing by-products such as acetals, formates and aldol products and convert them into the target product.

In a preferred embodiment of the process according to D1 (cf. paragraph 46 and 49) a plurality of reactors is used in series while adding water before the individual reactors.

The process according to claim 1 differs from this known production of alcohols in that the material fed to the first hydrogenation reactor has a sulphur content of below 10 ppm by weight.

The subject-matter of independent claim 1 and dependent claims 2-41 is therefore novel (Article 33(2) PCT).

2.2 D1 can be considered as representing the closest prior art to the subject-matter of claim 1.

Technical effects that could result from controlling the sulphur content of the material fed to the first hydrogenation reactor (which is influenced by the sulphur content of the starting olefin, the syngas and other components used in the hydroformylation reaction) include avoiding adverse effects on the catalyst performance (if the catalyst is poisoned by sulphur-containing compounds) and reducing the sulphur content of the final products.

However, the process of claim 1 is not limited with regard to the nature of the hydrogenation catalyst and encompasses the use of catalysts which are not sensitive to sulphur (e. g. the known Mo oxide catalysts). The only technical effect remaining for the whole scope of claim 1 is therefore a reduced amount of sulphur in the target products.

The objective technical problem may therefore be formulated reducing the amount of contaminants in the target products.

The solution proposed in claim 1 of the present application cannot be considered as involving an inventive step (Article 33(3) PCT) for the following reasons :

The skilled person would expect to obtain purer target products from less contaminated starting materials and it has to be regarded as obvious to use starting materials, including both the olefins and the syngas, having a low content of impurities (such as sulphur compounds, see D5, column 1, lines 11-22) in order to obtain purer target alcohols.

The definition of a certain desired purity of the material fed into the hydrogenation reactor can therefore not be considered as involving an inventive step.

2.3 It is furthermore known, that sulfur compounds are catalyst poisons (see for instance D5), and for syntheses, particularly those using sensitive catalysts, it is

obvious to use educts, including syngas, having a low sulphur concentration in order to prolong the catalyst life.

The aldolisation of hydroformylation products is a standard procedure to generate higher, branched products (cf. e. g. D2) and the skilled person would include such an aldolisation step in a process according to D1 if desired. The use of ionic liquids in hydrogenation processes is known from D3. The hydroformylation in two reactors and the recycling of unreacted gases from the hydroformylation and the subsequent hydrogenation is known from D4.

It has to be regarded as belonging to the routine work of the skilled person to include these features into the aforementioned processes. Dependent claims 2-41 do not seem to contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step.

2.4 The document D1 discloses (cf. paragraph 33) several methyl heptenes and the mixture of isomeric C8-olefins obtained in the dimerisation of butene (dibutene). Such mixtures are generally predominantly branched. D1 furthermore discloses (cf. example 1) a mixture of C9 aldehydes, suitable for use as hydrogenation feed stream for the production of C9 alcohols. The purity of these mixtures with respect to sulphur or chlorine is not disclosed.

However, a specific degree of chemical purity of low molecular compounds or mixtures thereof does not constitute a new element imparting novelty to the claimed subject-matter. A document disclosing such compounds or mixtures makes these available to the public within the meaning of Art. 33 (2) PCT in all grades of purity as desired by a person skilled in the art.

The subject-matter of claims 42 to 45 is therefore not novel (Article 33(2) PCT).

It is furthermore generally known that chlorine and sulphur are potential catalyst poisons (cf. D5) and it would have to be considered as obvious for the skilled person to provide an olefin or aldehyde feedstock low in these contaminants in order to prolong the catalyst life if necessary.